Estimation of Optimal Individualized Treatment Rule Using the Covariate-Specific Treatment Effect Curve with High-dimensional Covariates

Xiaohua Zhou

Beijing International Center for Mathematical Research and Department of Biostatistics, Peking University
E-mail: azhou@math.pku.edu.cn

Abstract: In this talk, we propose a new semi-parametric modeling strategy for heterogeneous treatment effect estimation and individualized treatment selection with a large number of baseline covariates. To achieve our goals, we first extend the concept of a covariate-specific treatment effect (CSTE) curve originally proposed by Zhou and Ma (2013) to the situation with high-dimensional covariates. The CSTE curve is estimated by a spline-backfitted kernel procedure, which enables us to further construct a simultaneous confidence band (SCB) for the CSTE curve under a desired confidence level. Based on the SCB, we then find the subgroups of patients that benefit from each treatment, so that we can make individualized treatment selection. The innovations of the proposed method are three-fold. First, the proposed method can quantify variability associated with the estimated optimal individualized treatment rule with high-dimensional covariates. Second, the proposed method is very flexible to depict both local and global associations between the treatment and baseline covariates in the presence of high-dimensional covariates, and thus is robust against model mis-specification. Third, the proposed method enjoys some good theoretical properties and hence can provide a sound basis for conducting statistical inference in making individualized treatment decisions with high-dimensional covariates. This is a joint wok with Wenchuan Guo at Bristol-Myers Squibb and Shujie Ma at University of California Riverside.